Future Combat Systems (FCS) Overview

Executive Summary

- The Army has structured the Future Combat Systems (FCS) program to include three different Spin Outs. FCS Spin Outs are a subset of the FCS program focused on providing FCS capabilities to the current force. The Army intends to field a Spin Out 1 capability to current force Modular Brigade Combat Teams (BCTs) starting in 2010. Spin Out 1 includes two types of unattended ground sensors, the Non-Line-of-Sight Launch System, and a corresponding information network linking these elements to the BCT. A detailed report on Spin Out 1 is provided following this overview.
- In 2007, the Army identified the content of two additional Spin Outs. Spin Out 2, currently planned to begin fielding in FY13, will consist of integrating the Short-range FCS Active Protection System (APS) into the Army's Stryker vehicle. Spin Out 2 will also integrate the mast mounted sensor from the FCS Reconnaissance and Surveillance Vehicle into selected Stryker vehicles. Spin Out 3, currently scheduled to begin fielding in FY15, will field the FCS Battle Command Network to current force BCTs to replace current command and control networks as well as the Armed Robotic Vehicle-Assault (Light), the Small Unmanned Ground Vehicle, and the Class I and IV Unmanned Aerial Vehicles (UAVs).
- The Army deferred development of the Class II and III UAVs as part of the FCS program. Class II and III UAVs remain an FCS objective requirement. Additionally, the Army deferred development of the larger Armed Robotic Vehicles (ARV).
- The Army removed the Intelligent Munitions System (IMS) from the FCS program; it is now a separate program of record.

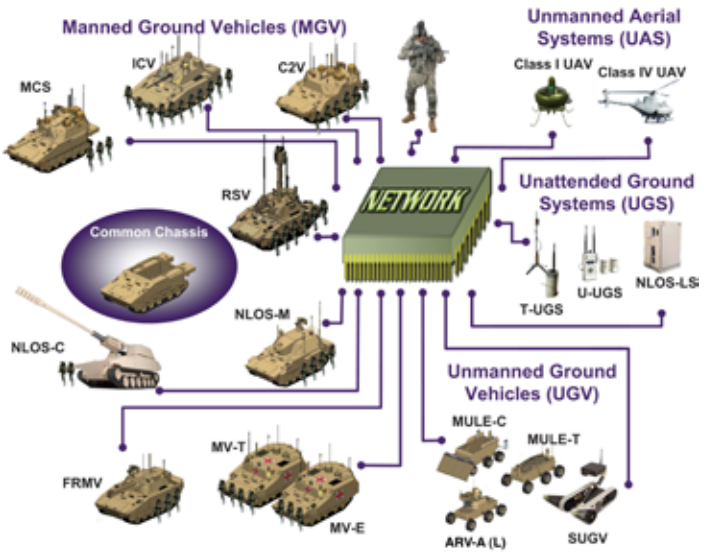
System

FCS is a networked system-of-systems consisting of 14 individual manned or unmanned systems linked together by an information network. The information network connects FCS via an advanced network architecture that provides joint connectivity and enhances situational awareness, understanding, and synchronized operations. The FCS operates as a system-of-systems and encompasses the FCS program systems as well as other complementary Army and joint systems in order to meet the missions of the Army's FCS BCTs.

The FCS program consists of manned and unmanned platforms that include:

Manned Ground Vehicles (Eight variants)

- Combat vehicles (Six variants):
  - Command and Control Vehicle
  - Infantry Carrier Vehicle
  - Non-Line-of-Sight Cannon
  - Non-Line-of-Sight Mortar



- Mounted Combat System
- Reconnaissance and Surveillance Vehicle
- Maneuver sustainment vehicles (Two variants):
  - Medical Vehicle (Treatment and Evacuation variants)
  - Recovery and Maintenance Vehicle

The Non-Line-of-Sight Cannon (NLOS-C) is the lead vehicle in the development of Manned Ground Vehicles. A detailed report on this system is provided following this overview.

Unmanned Aerial Vehicles (Four variants)

Class	FCS Unit Size	Time on Station	Operational Radius
I	Platoon	50 minutes	8 km
**II*	*Company*	*2 hours*	*16 km*
**III*	*Battalion*	*6 hours*	*40 km*
IV	Brigade	24 hours	75 km

** Since last year's report, the Army has deferred development of the Class II and III UAVs as part of the FCS program. Class II and III UAVs remain an FCS objective requirement.*

The Army intends the FCS UAVs to be multi-functional and mission tailorable; operable in varying terrain, including urban environments; and teamed with manned aircraft and ground maneuver forces.

Unmanned Ground Vehicles (Three types)

Type	Functions
Small Unmanned Ground Vehicle (SUGV)	• Reconnaissance of urban and subterranean battlespace
**Armed Robotic Vehicle (ARV) (two variants):* • *ARV-Reconnaissance, Surveillance, and Target Acquisition* • *ARV-Assault*	• *Reconnaissance, surveillance, and target acquisition* • *Line-of-sight and beyond line-of-sight fires*
Multi-functional Utility/ Logistics Equipment (MULE) (three variants): • MULE - Transport • MULE - Counter-mine • MULE-ARV - Assault (light)	• Transport of equipment and supplies • Direct fire in support of dismounted infantry • Detection of mines and improvised explosive devices

* *Since last year's report, the FCS program has deferred development of the larger ARV from its current program. The ARVs require more technological maturity before entering into system development. ARVs remain an FCS objective requirement.*

The Army plans to equip the MULE variants with the Autonomous Navigation System to provide the capability to operate all UGVs either in a man-in-the loop mode or in a semi-autonomous mode.

Unattended Munitions*

The Army intends the Non-Line-of-Sight Launch System (NLOS-LS) to provide networked, extended-range targeting, and precision attack of stationary and moving targets. It consists of a Container Launch Unit (CLU), with self-contained tactical fire control electronics and software for remote and unmanned operations, and the Precision Attack Munition missile. NLOS-LS is intended to be able to fire missiles with the CLU on the ground or mounted on a transport vehicle.

* *Since last year's report, the Intelligent Munitions System (IMS) has been removed from the FCS program and is now a separate program of record.*

Unattended Ground Sensors

FCS Unattended Ground Sensors (UGS) are an array of networked sensors capable of target detection, location, and classification. UGS consist of multiple types of sensors to include acoustic, seismic, magnetic, electro-optical/infrared sensors, and radiological/nuclear sensors. UGS is intended to be employed to provide enhanced threat warning and situational awareness.

The FCS UGS program is developing two major sensor subgroups:

- Tactical-UGS (two variants):
  - Intelligence, surveillance, and reconnaissance sensors
  - Radiological and nuclear sensors
- Urban-UGS is an array of small, lightweight imagery and intrusion detection sensors emplaced in urban structures.

Battle Command Network

The Battle Command Network is the information network that links together the FCS BCT system-of-systems. The Battle Command Network consists of hardware and software that is intended to deliver video, still images, voice, data, and network control services throughout the FCS BCTs. It is intended to provide an interconnected set of information capabilities for collecting, processing, displaying, disseminating, storing, and managing information on demand with secure and reliable access by soldiers throughout the FCS BCT. This network is intended to include communications payloads on all FCS ground and air platforms and network management software distributed on all platform computers and communications payloads.

Mission

The FCS BCT will perform all tactical operations – offensive, defensive, stability, and support – currently conducted by light infantry, Stryker, and heavy mechanized forces. The Army intends for the FCS BCT to provide a measurable improvement over current brigade combat teams in terms of deployability, maneuverability, survivability, lethality, battle command, sustainability, and joint interoperability.

Activity

- In 2007, the Army defined two additional Spin Outs of FCS systems to current force BCTs. The T&E program to support Spin Outs 2 and 3 will be addressed in the FY08 FCS Test and Evaluation Master Plan (TEMP) Update.
- The FCS program deferred development of two UAV variants (Class II and III) and the ARVs. These systems remain objective requirements for FCS. It is not clear at this time when and under what circumstances these systems might be reintroduced into the FCS program.
- The Army Evaluation Task Force (AETF) (formerly the Evaluation Brigade Combat Team) was established at Fort Bliss, Texas. The AETF is intended to provide the test unit to support FCS system development and will be sized and equipped to meet FCS operational test requirements as well as supporting developmental testing as required.
- Design efforts for all FCS systems are ongoing. All preliminary design reviews (PDR) for FCS systems are

planned to be completed by the end of 2008 leading to an FCS system-of-systems PDR in early 2009.
- The program initiated two additional incremental armor upgrades for the Manned Ground Vehicles (MGV) aimed at achieving a satisfactory level of vehicle ballistic protection within vehicle weight constraints.
- The Class I UAV is being redesigned to incorporate a laser range finder and laser designator.
- The Mid-Range Munition (MRM) was funded for system development and production. The MRM is a beyond line-of-sight 120 mm guided munition intended to be fired from the FCS Mounted Combat System. It is an FCS complementary system, which, although not managed by the FCS program, is intended to be a key element in overall FCS BCT battlefield lethality. MRM is a DOT&E oversight program and it will have a TEMP and LFT&E strategy approved by the Director.

Assessment
- The AETF is key to the FCS test program by providing a stable, dedicated brigade-size unit to support FCS throughout the course of its developmental and operational testing.
- The FCS program continues to address the challenges imposed on the MGVs by the requirement to transport three MGVs on a C-17. The resulting constraint on MGV size and weight will continue to pose challenges to MGV designers to balance tactical survivability and lethality and MGV payload capacity with the requirements for air transportability.
- The Army is working MGV armor upgrades to achieve the desired level of weight and performance while still adhering to the current MGV program schedule.
- Overall platform survivability will be dependent upon an effective Hit Avoidance System that includes an Active Protection System. While Active Protection System technologies are showing some promise, it is not yet clear whether their performance will make up for lesser levels of MGV armor protection than those found in current force combat vehicles such as the Abrams tank and Bradley fighting vehicle.
- The FCS program continues its efforts to synchronize Joint Tactical Radio System (JTRS) and Warfighting Information Network -Tactical (WIN-T) systems development schedules with those of FCS. While progress is being made in this area, these non-FCS complementary programs remain a significant risk area for the FCS program. The effectiveness of the FCS battle command network will depend upon JTRS and WIN-T performance.
- The Class I UAV will require significant design and development in order to meet system requirements. Integration of a heavy fuel engine and sensor package, system weight and size, and operational endurance are risk areas the program is working.
- Adequate operational testing of the FCS BCT will require a high fidelity Real Time Casualty Assessment (RTCA) system. In particular, the ability to adequately evaluate the force-level lethality and survivability of the FBCT will be highly dependent upon such RTCA. In 2007, the Army Test and Evaluation Command (ATEC) reverted to using the Multiple Integrated Laser Engagement System (MILES) as an engagement system for operational testing due to developmental challenges associated with the prospective high fidelity test RTCA. MILES is not satisfactory for use as test instrumentation. It is as yet not clear that the Army and ATEC are committed to the development of an adequate RTCA system necessary to support FCS operational testing.

Recommendations
- Status of Previous Recommendations. DOT&E continues to be concerned about the impact of the MGV design trades necessary to balance tactical survivability, lethality, and payload capacity with the requirements for air transportability. The Army believes that these trades will not compromise the operational effectiveness and survivability of the FBCT and that the existing air deployability requirements are essential to the overall effectiveness of the FBCT.
- FY07 Recommendations.
  1. In the FY08 TEMP update, the FCS program must:
     - Retain the existing planned series of operational test events culminating in an IOT&E with a fully equipped FCS BCT operating in a sophisticated and robust enemy threat environment; this live brigade-size IOT&E will be essential to assessing the operational effectiveness and suitability of the FCS system-of-systems
     - Maintain its commitment to provide the number and configuration of MGV prototypes for Limited User Test 3 and ballistic testing that were laid out in the FY06 TEMP
     - Outline the program's approach to adequate testing of the MGV's Hit Avoidance System, including the Active Protection Systems for both the FCS MGVs and Stryker
     - Clarify the path for developing and integrating the evolving MGV armor upgrades
  2. The Army should review its test instrumentation development and procurement strategy to ensure that an adequate high fidelity RTCA system is available to support FCS operational testing.